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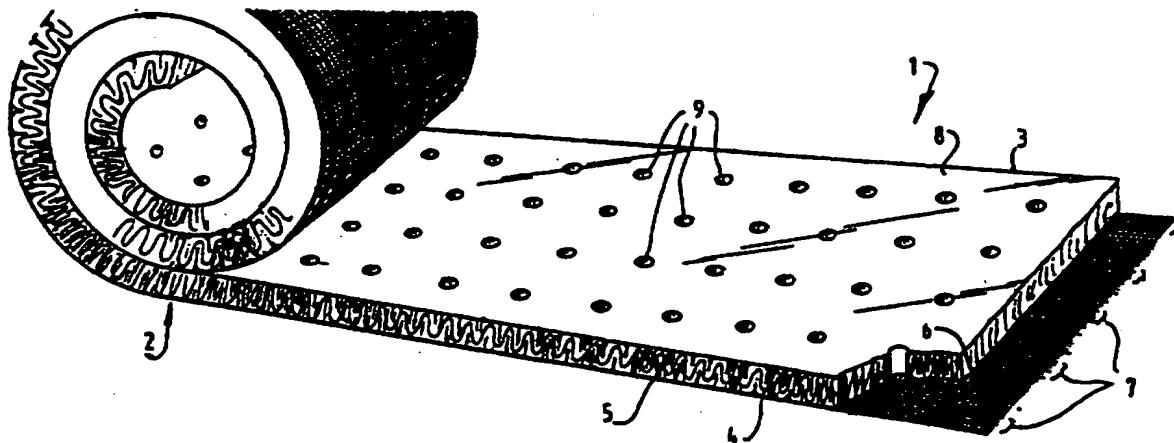
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(57) Abstract

The invention relates to a substrate for multifold culture comprising a layer of mineral wool, which layer is provided on at least one side with a porous covering layer, and to a method for multifold culture of plants on a substrate, comprised of (i) arranging a substrate as claimed in claims 1-7, (ii) cultivating the plants on the substrate, (iii) harvesting the plants, (iv) repeating steps (ii) and (iii).

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SUBSTRATE AND METHOD OF MULTIFOLD CULTURE

The present invention relates to a substrate suitable for multifold culture of plants, and to a method in which such a substrate is applied.

In the culture of once-only harvestable plants such as cut flowers, the whole of the plant is removed, whereafter a new culture takes place on a new substrate.

As culture system can be used aqueous systems, in which the plant hangs with its roots, or substrate beds in which the plant is cultivated. Peat, pumice and clay granules can be used for such substrates.

The invention has for its object to provide a substrate and a method for multifold culture, wherein the culture takes place at the lowest possible cost, labour costs remain limited and an optimum culture of the plants can be realized.

This is achieved with a substrate for multifold culture according to the invention which comprises a layer of mineral wool, which layer is provided on at least one side with a porous covering layer.

By making use of the porous covering layer which can be present on both the top side and bottom side a substrate is provided in which a plant can grow. After harvesting there is no or little damage to the substrate and a plant can be arranged again at the same or adjacent position for the subsequent culture.

The covering layer acts herein on the one hand as strengthening of the layer of mineral wool to limit damage during harvesting and on the other to provide a sturdier product which can be supplied in rolled-up form.

According to a preferred embodiment the layer of mineral wool is provided on two sides with a porous covering layer. An optimal substrate is thus provided, on the one hand due to the formed sandwich structure and on the other because the covering layer also acts as drainage layer on the bottom side and as pressure equalizing layer on the top side.

The covering layer can be fixed to the mineral wool layer in different ways. The fixing can for instance take place by adhesion, for instance by making use of a hot-melt. This adhesion does not have to take place over the whole
5 contact surface but can be effected by adhesive points and adhesive tracks.

Another manner of fixing is by means of a mechanical join by making use of a thread whereby the covering layer is stitched or sewn to the mineral wool layer. Use can be made
10 for the stitching or sewing of a natural, synthetic or metal thread.

The covering layer can consist of a non-woven material, a woven material or a mesh. For this purpose can be used natural materials, plastic materials and even metals.
15 Preference is given to materials which are recyclable, possibly recyclable together with the layer of mineral wool.

If the covering layer forms the bottom layer, it is recommended that roots cannot penetrated through the covering layer. This greatly enhances the culture because the plant
20 roots cannot leave the substrate on the underside thereof during culture. This offers all kinds of advantages in the supply and draining of feed water.

The layer of mineral wool can consist of known mineral wool materials such as rockwool, glass wool and slag wool.
25 This wool consists of mineral fibres which are mutually joined by a cured binder, usually a curable resin. In order to optimize the wetting properties of the substrate it can be recommended to add to the substrate a wetting agent, usually a tenside.

30 The substrate according to the invention preferably has a substrate thickness of 1-5 cm, usually only 1-3 cm.

The density of the layer of mineral wool amounts generally to 10-80 kg/m³, usually only 30-60 kg/m³.

In its laid-out state the substrate can be provided on
35 its top side with holes for receiving substrate plugs in which the plant is pre-cultivated. It is further possible for the plant, already pre-cultivated in a plug or block, to be placed directly onto the substrate. In the case the substrate is provided with a top covering layer the plug or block is

placed on the covering layer or a hole is made therein to reach the upper part of the substrate.

The orientation of the fibres for the mineral wool can extend parallel to, transversely of or in intermediate
5 orientation to the mineral wool layer.

The culture with a substrate according to the invention can take place using known culture systems, such as the ebb/flood system, spraying systems or systems in which use is made of drippers, spray pins and the like.

10 The distance between the plants for culture can be freely chosen or is determined by the plant holes arranged therein.

Another aspect of the present invention relates to a method of cultivating plants wherein use is made of the above
15 described substrate.

The substrate is arranged, possibly rolled out from a roll, whereafter the plants are placed thereon, and the plants are subsequently harvested by cutting, pulling and the like. Plants are then placed once again and cultivated on the
20 already present substrate.

This multifold culture can be repeated two to for instance ten times, depending on the manner of harvesting and the therein occurring damage to the substrate. The damage to the substrate is herein also dependent on the fact of whether
25 the covering layer is situated on the top side, the bottom side or both sides of the substrate.

Mentioned and other features of the substrate and the method according to the invention will be further elucidated hereinbelow on the basis of two embodiments to which
30 reference is made. These embodiments are only given by way of example without the invention having to be deemed limited thereto.

In the drawing:

figure 1 and figure 2 each show a perspective, partly
35 broken away view of a partly rolled-out substrate according to the invention; and

figure 3 shows on a large scale detail III of figure 2 during repeated culture.

The description of the drawings:

Figure 1 shows a substrate 1 according to the invention which is unrolled from a roll 2.

The substrate 1 consists of a layer 3 of mineral wool, such as rockwool. Layer 3 has a thickness of 3 cm and a
5 density of 40 kg/m³. The fibres 4 of layer 3 are oriented substantially vertically.

In rolled-out situation the substrate 1 has on one side, that is, the bottom side, a bottom covering layer 6 which is adhered to the bottom side 5 of substrate 1 using
10 hot-melt applied in lines 7. The bottom covering layer consists in this case of a weave of multifold filament polypropylene fibres. Instead of synthetic fibres use can be made of natural fibres such as fibres of jute, cotton, sisal and the like.

15 The top side 8 of substrate 1 is provided with plant holes 9 in which the plants for cultivating can be arranged directly or already pre-cultivated in a plug. In the case of multifold culture the plants do not have to be arranged in connecting plant holes but one or more plant holes can be
20 omitted, these plant holes being used in subsequent cultures.

It is noted that roots cannot pass through the bottom covering layer 6 since the mesh opening of the bottom covering layer 6 is too small to allow penetration by roots. The mesh width is smaller than 1 mm, preferably smaller than
25 0.1 mm. Because the mineral wool layer 3 is adhered to the bottom covering layer 6, none or only a limited portion of the substrate will be removed when the plant is harvested from the plant hole 9 with root and stem. The damage is however not of a nature such that a new culture cannot be
30 started in adjacently situated plant holes.

Figure 2 shows a substrate 10 according to the invention which once again consists of a layer 11 of mineral wool in which now the fibres 12 are oriented horizontally. Layer 11 is provided on its top side 13 with a top covering
35 layer 14 and on its bottom side 15 with a bottom covering layer 16.

The top covering layer 14 and the bottom covering layer 16 have a larger mesh opening size (2-10 mm). Roots can thereby easily pass through the top covering layer 14 and the

plants for cultivating can be placed thereon in a block. The bottom covering layer 16 is properly water-permeable whereby optimum drainage can take place.

Figure 3 shows a detail of figure 2, wherein the roots 19 of the plant 17, such as a chrysanthemum pre-cultivated in a substrate block 18, grow through the top covering layer 14 into the mineral wool layer 11. After culture the block 18 is removed and root remnants 20 will remain behind in the substrate. Due to the presence of the top covering layer 14 substantially no damage will occur, whereby it is even possible to re-start a culture on the original position of substrate block 18.

Although in the drawings is only shown that the joining of the covering layers is performed by means of adhesion, it will be apparent that one or more covering layers can be fixed to the layer of mineral wool by means of stitching, because an interference with the culture thereby occurs.

In the case of an ebb/flood culture system the roll 2 is rolled out into a channel of the ebb/flood system. In the case of an spraying system the substrate can be rolled out onto a water-permeable layer, whereafter spraying takes place from above. It is further possible to cause the supply of nutrients and liquid to take place using drippers and spray pins.

Substrate 1 according to the invention is supplied on a roll onto which can be rolled 30 to 40 metres of substrate. A roll still has a manageable form since the layer of mineral wool is compressible in rolled-up form and expands to its original thickness dimension after laying out in the culture system.

Diverse plant groups can be cultivated with the substrate and the method according to the invention. As stated, once-only harvestable cut flowers (chrysanthemums), perennially harvestable cut flowers (carnation), flowering bulbous plants (such as freesia) and flowering rhizomatous plants (such as alstroemeria).

CLAIMS

1. Substrate for multifold culture comprising a layer of mineral wool, which layer is provided on at least one side with a porous covering layer.

2. Substrate as claimed in claim 1, wherein the mineral wool layer is provided on two sides with a porous covering layer.

3. Substrate as claimed in claim 1 or 2, wherein the covering layer is fixed to the mineral wool layer by adhesion, mechanical joining and the like.

4. Substrate as claimed in claims 1-3, wherein the covering layer comprises non-woven material, woven material, mesh and the like.

5. Substrate as claimed in claims 1-4, wherein the covering layer forms a bottom covering layer and is not penetrable by roots.

6. Substrate as claimed in claims 1-5, wherein the substrate thickness amounts to 1-5 cm, and the density to 10-80 kg/m³.

7. Substrate as claimed in claims 1-6, wherein the substrate is rolled up into a roll.

8. Method for multifold culture of plants on a substrate, comprising of

- i) arranging a substrate as claimed in claims 1-7
- ii) cultivating the plants on the substrate
- iii) harvesting the plants
- iv) repeating steps ii) and iii).

9. Method as claimed in claim 8, wherein the steps ii) and iii) are repeated 2-10 times.

10. Method as claimed in claim 8 or 9, wherein the plants are harvested by pulling the plant out of the substrate.

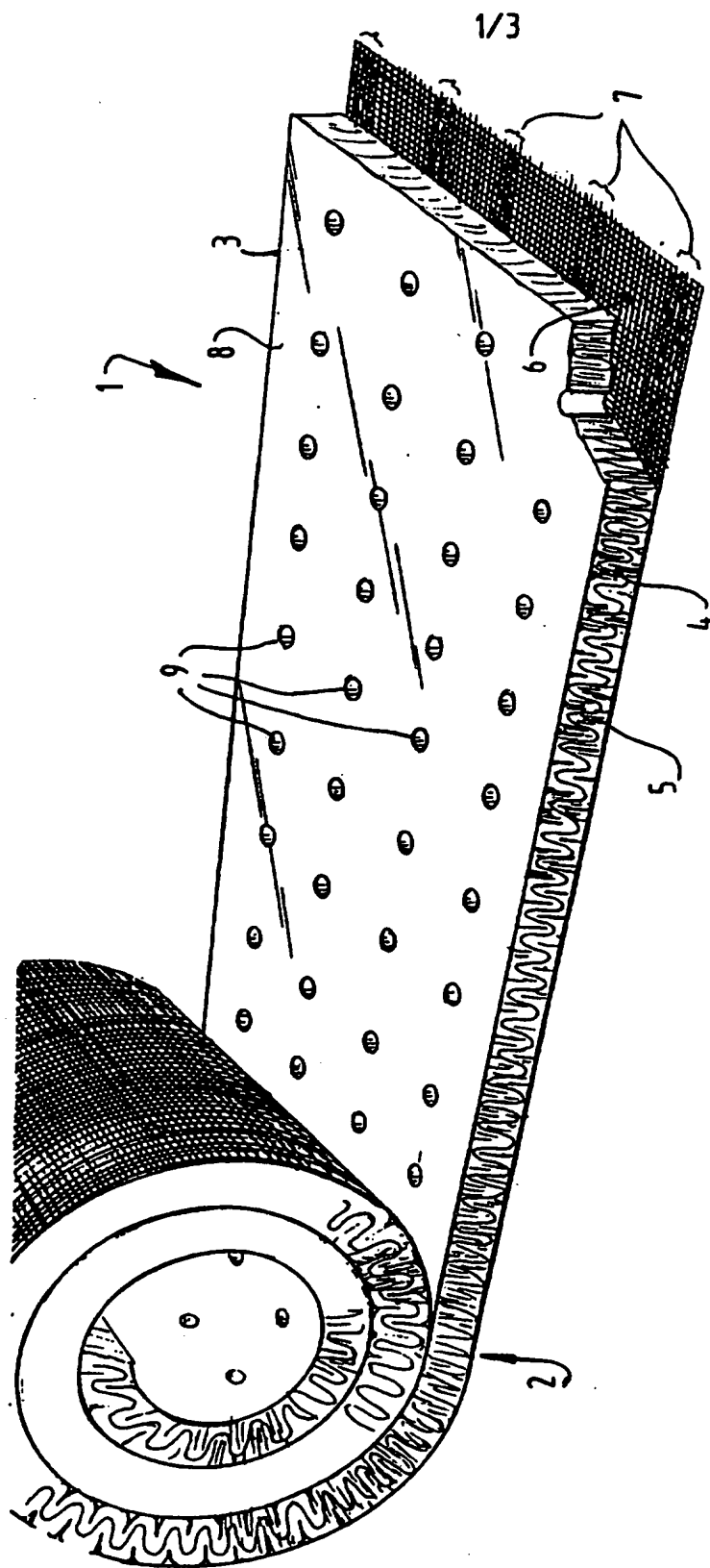
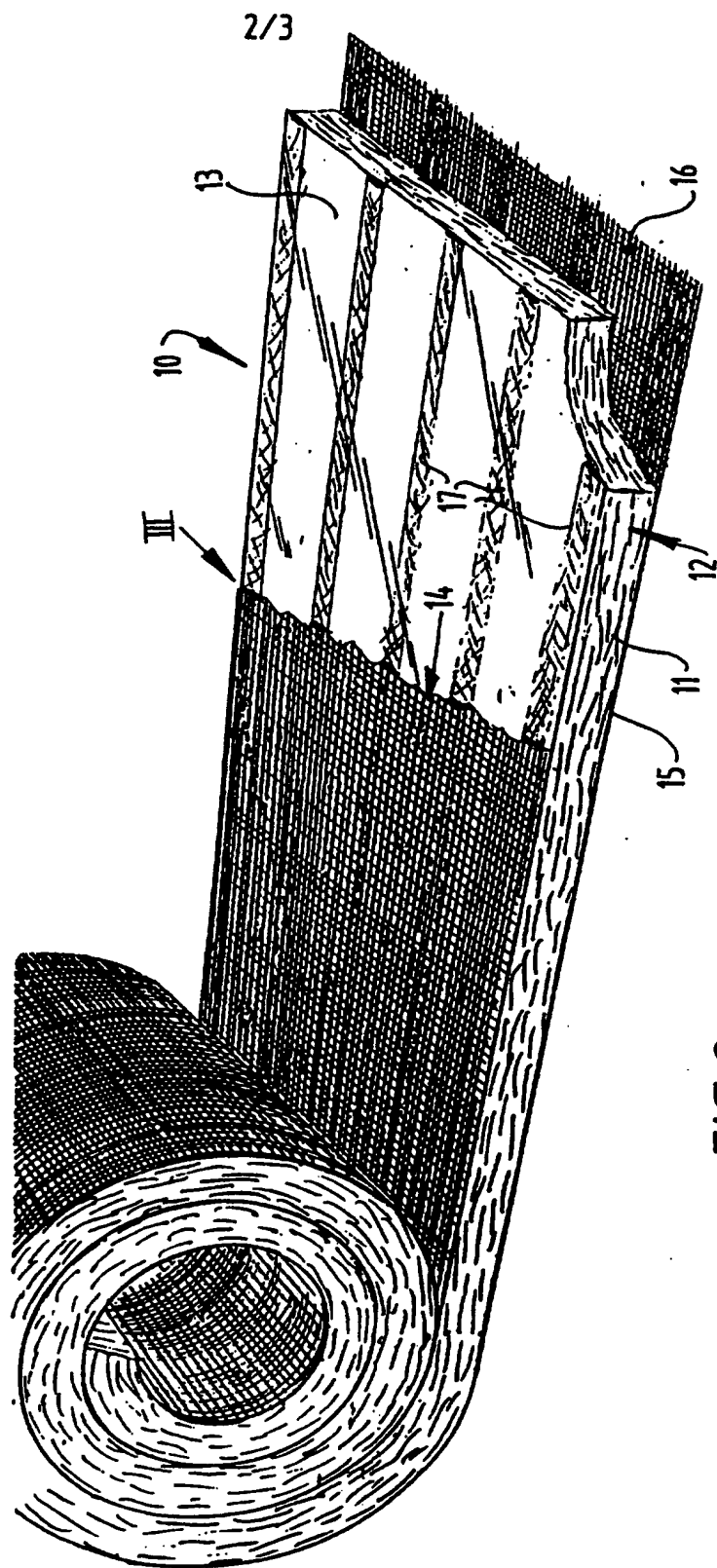
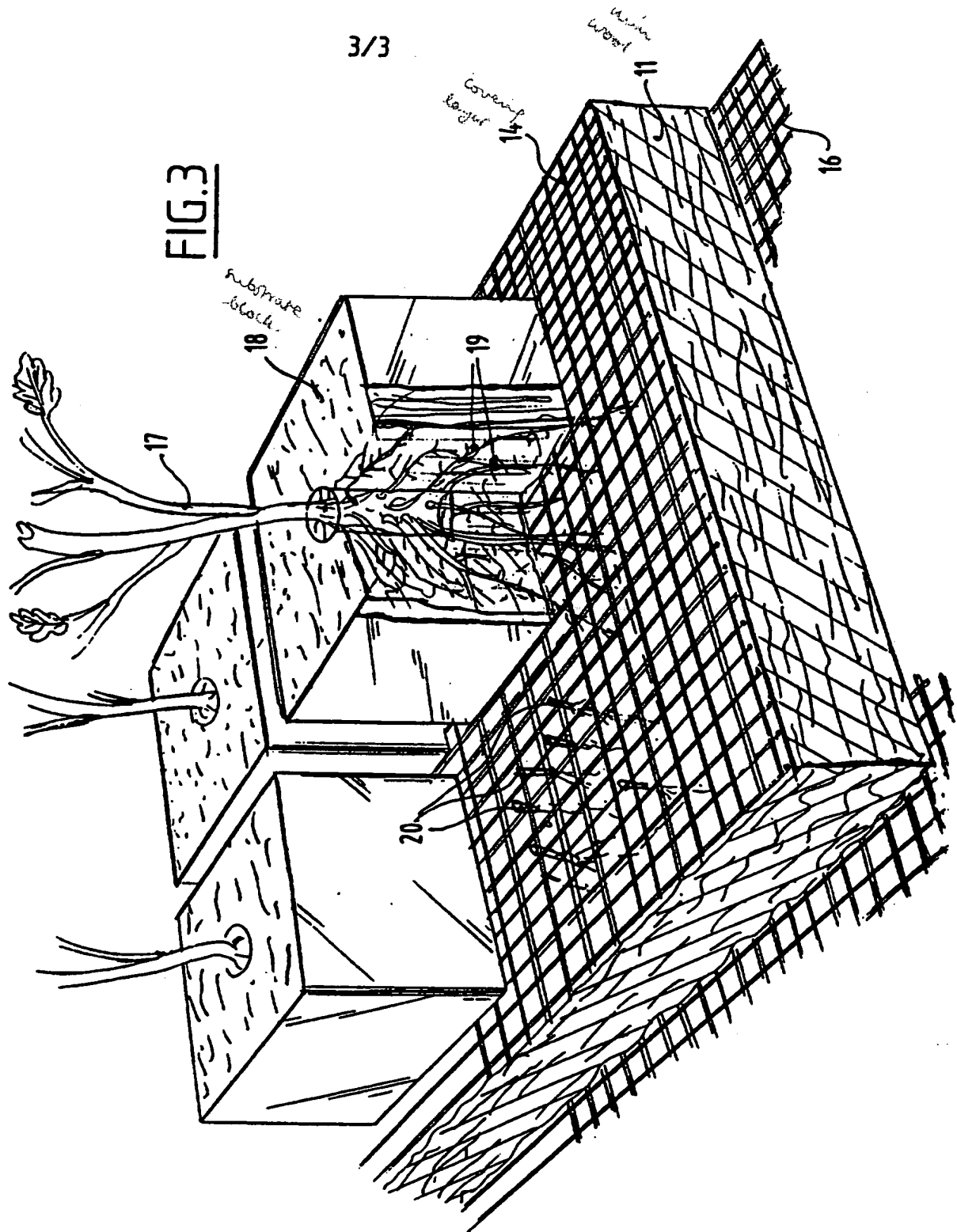


FIG. 1





INTERNATIONAL SEARCH REPORT

International Application

PCT/NL 95/00251

A. CLASSIFICATION OF SUBJECT MATTER
IPC 6 A01G31/00

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 6 A01G

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	EP,A,0 448 153 (OKHUISEN) 25 September 1991 see column 1, line 43 - column 3, line 9; figure 1 ---	1,3,4
X	FR,A,2 608 009 (DEPREZ) 17 June 1988 see the whole document ---	1,2,4,7
A	DE,A,20 41 192 (DEUTSCHE SEMPERIT GUMMIWERK GMBH) 4 March 1971 see page 7, last paragraph - page 8, paragraph 4 see page 10, last paragraph - page 11, paragraph 3; figures 3,4 --- -/--	1-4,7

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INTERNATIONAL SEARCH REPORT

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C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	FR,A,2 641 442 (BEGHIN-SAY S.A.) 13 August 1990 see page 5, line 1 - page 6, line 26; figures	1,4,5
A	--- NL,A,9 201 639 (DE JONG) 18 April 1994 see the whole document -----	1

INTERNATIONAL SEARCH REPORT

information on patent family members

International Application

PCT/NL 95/00251

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
EP-A-448153	25-09-91	NL-A- 9000559	01-10-91
FR-A-2608009	17-06-88	NONE	
DE-A-2041192	04-03-71	AT-A- 312982	15-12-73
		AT-A- 326938	12-01-76
		AT-A- 326939	12-01-76
		CH-A- 506939	15-05-71
		FR-A- 2059326	28-05-71
		GB-A- 1296727	15-11-72
		NL-A- 7012525	02-03-71
FR-A-2641442	13-08-90	NONE	
NL-A-9201639	18-04-94	NONE	